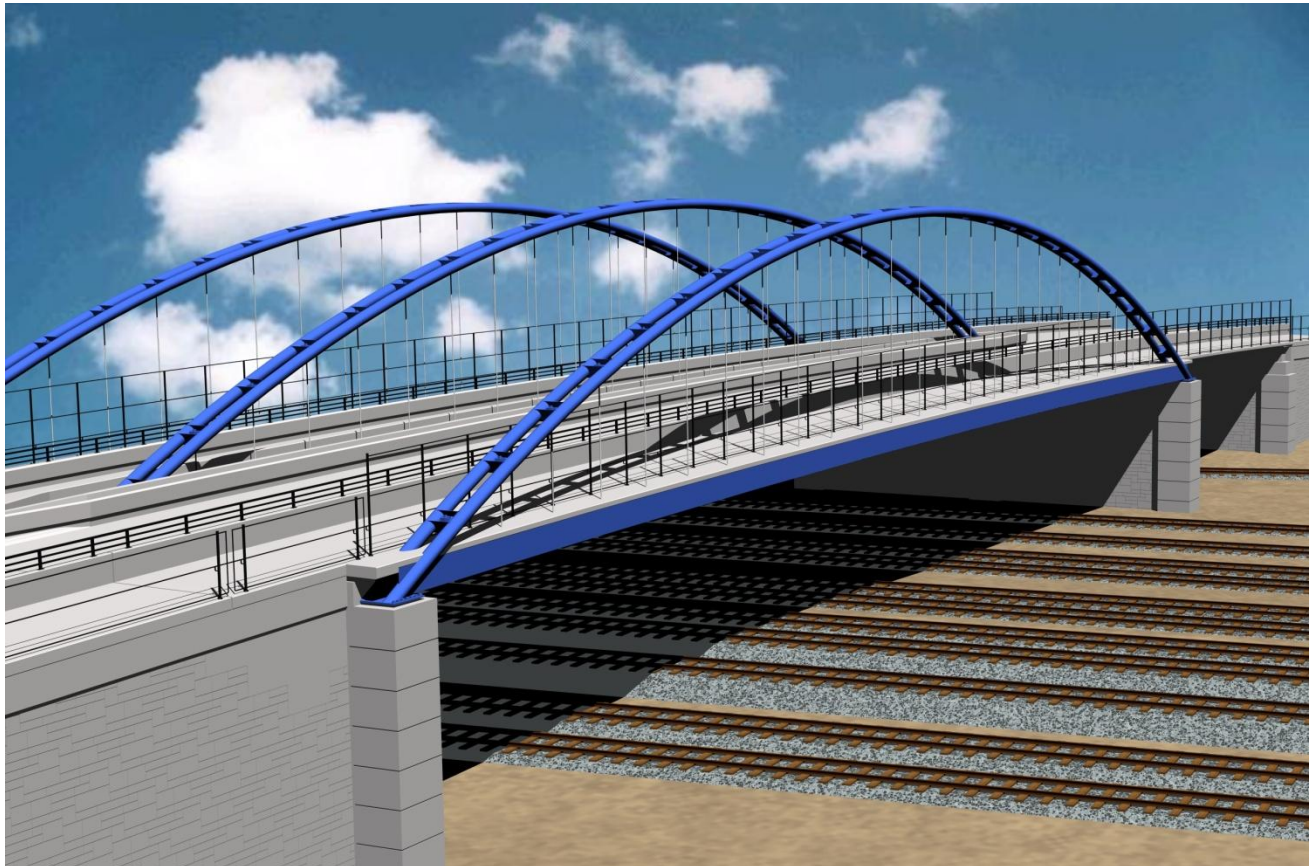


**NEBRASKA DEPARTMENT OF ROADS
SUPPLEMENTAL INSPECTION PROCEDURES**

**COLUMBUS VIADUCT
COLUMBUS, NEBRASKA
PROJECT NO. NH-30-5 (125)
STRUCTURAL NO. S030 37847
CONTROL NO. 31382**

Prepared by the Bridge Office

February 2012



Structure Descriptions:

The Columbus Viaduct is a 356'-0" two span bridge constructed in 2009 over the twelve Union Pacific rail lines. Span one is 260'-0" tied-arch and span two is a span 96'-0" rolled beam steel girder span. The bridge has four lanes on a 50'-0" clear roadway with a 7'-0" wide median. There are 10'-0" wide sidewalks on both sides of the bridge with 11' high chain-link fence over the RR tracks.

The tied-arch span is made up of three arches. Each arch is made up of two steel pipes filled with concrete. The tie-beams are steel box beams filled with concrete and two ducts with multiple steel prestressing strands. The tie-beams and the concrete deck are post-tensioned, so the arches, tie-beams and concrete deck are all in compression.

The hanger rods are 1 3/4" Ø high strength threaded rods, with double nuts at the bottom and a single nut with a weather proof cover at the top.

Inspection Equipment and inspector requirements:

The snooper truck will be essential part in the inspection of the Arch Bridge. Where possible, the required supplemental visual inspection shall be done within arm's reach. Where snooper access is not possible for the items under the deck, inspectors shall use mirror or high power projectors and binoculars to visually inspect the items from the ground, in close coordination with the railroad.

Scheduling Inspection with Union Pacific Railroad:

It's the railroads recommendation that inspection should be done within the first 9 months of the year. There is increased freight traffic during the holiday period beginning in September thru the month of December.

The contact person for the required track scheduling will be:

Mike Benjamin
Manager of Special Projects Industry and Public
6455 East Commerce Avenue
Kansas City, MO 64120
Phone (816) 399-1703

Purpose of the Supplemental Manual

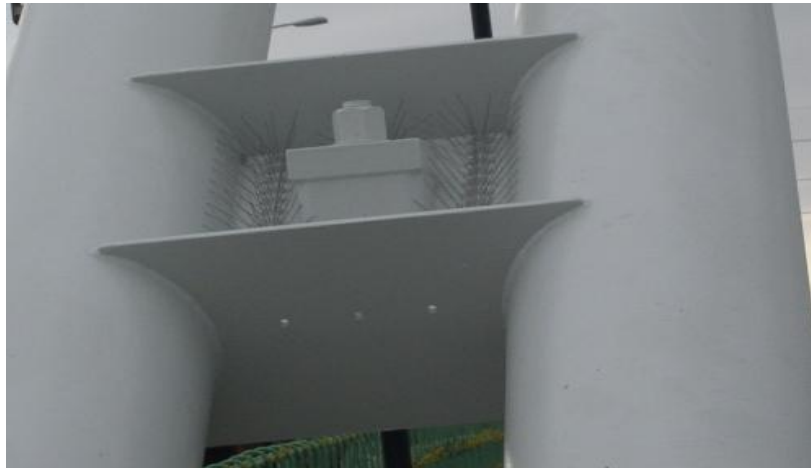
The purpose of the supplemental manual is to aid the inspectors in identifying potential problem areas that are unique to this type of structure. Routine elements that are normally inspected by the inspector and already known to the inspector will not therefore be repeated in the supplemental manual.

With the Columbus Bridge being one of two tied-arch bridges in the state of Nebraska there are certain key elements and connections that need to be inspected for the maximum longevity of the structure. The simple span shall be inspected as such.

These procedures are valid until the structure is 30 years old. At that point these procedures will be re-evaluated for possible access changes. Unless the inspection intervals are reduced due to defects, the maximum inspection interval is 24 months.

Inspecting Hanger Rod:

Connections at the top



The hanger connection between the two arch pipes is a critical welded connection.

Inspectors should inspect all welds connecting the hanger to the pipe. Inspectors shall insure the weep holes in the hanger plates are clear of debris that would inhibit proper drainage on the hanger plates.

Connections at the Bottom of Box



The above photo shows the Threaded Nuts at the bottom of the hanger rods. Nuts at the top and bottom of the hanger rods shall be inspected for cracks as well as tightness.

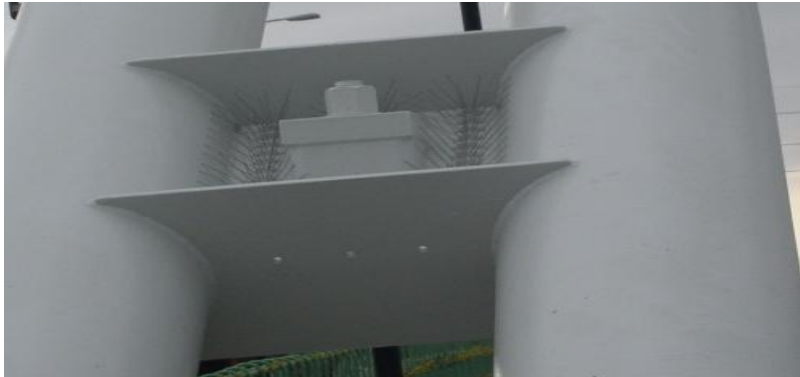
The welds on the beveled plates located as shown in the above photo where the threaded rod is attached to the bottom of the box should also be inspected.

If necessary the removal of all pigeon nesting should be done before inspecting.

The Columbus Viaduct does have bird spikes at the hanger connection.

If the pigeon nesting is causing drainage problems and causing what might be perceived as continuing detrimental damage to the hanger devices, it may be necessary to add more bird spikes at the recommendation of our inspectors.

Below are pictures of the wire spikes that were used on the Columbus Viaduct.



Inspecting the entire length of the Hanger Rods:

All hanger rods above the deck shall be inspected using a snooperscope. The grout placed at the intersection of the hanger rods with the concrete deck shall be closely inspected as any failure to this seal will cause moisture to accumulate around the rods inside the tied beam where inspection is not possible.

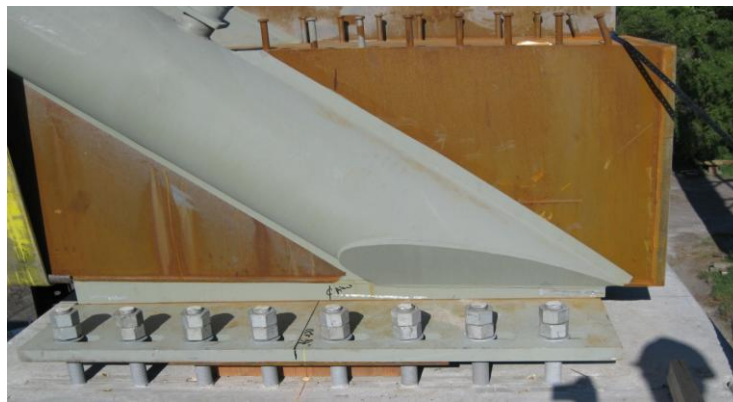
Inspecting Bolted Floor Beam Connections:

Below is a picture of the bolted connection. The floor beams are bolted onto a steel angle and then the angle is bolted onto the steel box tie-beam. Where access is possible, the bolted connections shall be inspected to insure all the bolts are still tight and to insure no cracking has occurred between the drilled holes in the angle. At locations where access from above deck is not possible, inspection with a binocular and a high power projector shall be conducted from the ground through a close coordination with the RR.



Inspecting the Expansion Devices:

All visible welds at the arch to tie beam and the tie-beam box to Sole Plate connection shall be inspected for cracks.



All slots in the Expansion devices should be checked for cracks and the clearance between the bolts and the slots should also be checked for the proper allowed movement.



Inspector should loosen one set of bolts in abutment No. 1 to verify the gap between the bolt and the end of the slot and record the ambient temperature. The loosen bolts shall be hand tighten again after inspection.